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(54) Title: METHOD FOR IMPROVING THE HANDING OVER A CONNECTION FROM ONE SGSN TO ANOTHER SGSN
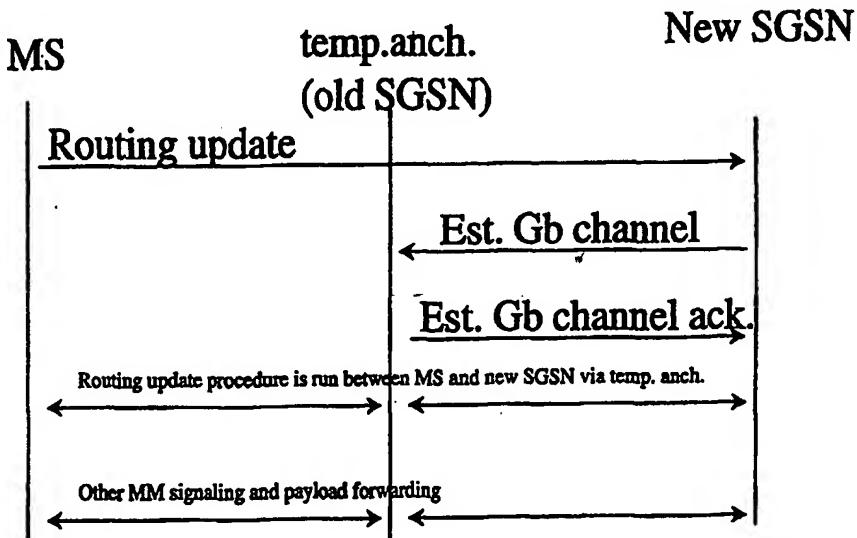
(57) Abstract

The present invention relates to a method for improving the handing over of a connection from one SGSN (I) to another, i.e. when an MS (Mobile Station) moves from one SGSN service area to another, and for the purpose of not interrupting the packet transmission and possible layer 3 procedures, and for optimizing the network utilization without adding complexity to SGSN, it is according to the invention suggested that at inter SGSN routing update, the old SGSN (I) is given the role as a temporary anchor whereas the other (new) SGSN (II) is temporarily working as a serving SGSN.

METHOD FOR IMPROVING THE HANDING OVER A CONNECTION FROM ONE SGSN TO ANOTHER SGSN

5   ## Field of the invention

The present invention relates to a method for improving
the handing over of a connection from one SGSN to an-
other, i.e. when an MS (Mobile Station) moves from one
10   SGSN service area to another.

Background of the invention

15   More specifically the present invention relates to GPRS
service on GSM.

When a mobile station (MS) in active GPRS modus, i.e.
transmitting information, moves from one SGSN service
20   area to another, the packet transmission and possible
layer 3 procedures should not be interrupted.

Due to the complex state machines for the layer 3 proce-
dures, changing SGSN directly implies transmitting very
25   large amounts of control data from one SGSN to another.
Another problem is ongoing transactions with other net-
work nodes which also has to be redirected to the new
SGSN.

30   ## State of the art
GSM voice service uses an anchor concept to solve the
problem. That means that in the network node (MSC/VLR) a
connection is primarily established and is kept through-
out the whole call. This node is entitled 'anchor
35   MSC/VLR'. If the subscriber moves into another MSC/VLR's
coverage area, the new MSC/VLR acts only as a transit
node. This node is entitled 'serving MSC/VLR' whereas the

connection control still resides in the anchor MSC/VLR
throughout the call.

Problems related to prior art

5   GPRS has no working solution on this problem yet. Due to
the long connection times for GPRS (hours) compared to a
circuit switched connection (minutes), a similar solution
for GPRS may result in a great number of anchor-serving
legs.

10

Objects of the invention

An object of the present invention is to provide a method
15   for improving the handing over of a connection from one
SGSN to another, whereby the packet transmission and pos-
sible layer 3 prosedures are not interrupted.

Another object of the present invention is to provide
20   such a method by which the layer 3 procedures do not have
to be designed for supporting inter SGSN routing update.

Still another object of the present invention is to pro-
vide a method by which the risk of losing payload packets
25   is minimized.

Yet another object of the present invention is to provide
a method by which the tunnelling of payload packets from
one SGSN to another is not required, thereby simplifying
30   the design necessary therefor.

Still another object of the present invention is to pro-
vide a method which optimizes the network utilization
without adding complexity to SGSN.

35

Another object of the present invention is to provide a
method by which the service degration when handing over a

connection from one SGSN to another is minimized as expe-
rienced from the MS point of view.

5   Brief disclosure of the invention

In a method as stated in the preamble, the above objects
are achieved by the features as stated in the enclosed
patent claims.
10

In other words, the present method suggests that at inter
SGSN routing update, the old SGSN gets the role as a tem-
porary anchor whereas the new SGSN works temporarily as a
serving SGSN. This leg is kept as long connection control
15   procedure are processing including data packet transmis-
sion. When all activities have ceased for the connection,
i.e. no data transmission, no layer 3 procedures and no
on-going transactions towards other networks nodes, the
connection control is moved from anchor to serving SGSN.
20

The leg between anchor and serving SGSN is a Gb interface
with minor modifications. Some control signalling is re-
quired to handle radio resources.

25   Further advantages and features of the present method
will appear from the following description taken in con-
junction with the appending drawings, as well as from the
enclosed patent claims.

30

Brief disclosure of the drawings

Fig. 1 and Fig. 2 are signalling sequence layouts, illus-
trating the principle of how inter SGSN routing update is
35   carried out in two steps.

Description of embodiments

As explained in the preamble, the present invention re-
5   lates to a method method to "hand over" a connection from
one SGSN to another without interrupting packet transmis-
sion and control signalling. The method allows the net-
work to create a temporary leg between the old and the
new SGSN. The temporary leg prevails until the state of
10   the connection in the anchor SGSN can be securely trans-
ferred to the new SGSN while at the same time redirecting
packet transfer to go directly from/to SGSN to/from the
new SGSN.

15   With reference to Fig. 1 and Fig. 2 it is illustrated by
means of a signalling sequence how the principle of inter
SGSN routing update is carried out in two steps.

This construction has the advantage of not impacting on-
20   going layer 3 procedures and any payload transmission.
Actually, the layer 3 procedures do not have to be de-
signed to support inter SGSN routing update since the
temporary Gb channel is not visible for layer 3. Today's
solution in GPRS require that all layer 3 procedures must
25   be designed to cater for an inter SGSN routing update.

Since the context take-over from temp. anchor to new SGSN
takes place when the connection has entered a standby
state, the risk for loosing payload packets is minimised.
30   And since there is no traffic ongoing, the tunnelling of
payload packets from temp. anchor to new SGSN is not re-
quired, thereby simplifying the design.

The temp. anchor principle also simplifies signalling to
35   between SGSN and external nodes. Since the solution al-
lows the connection to finish up ongoing transactions be-
fore moving the context to new SGSN, services such as

charging may be completed towards billing gateway in the normally manner before the context is moved to the new SGSN and charging is resumed.

5 **Merits of invention**
The solution optimises the network utilisation without adding complexity to SGSN. The subscriber will not experience any loss of service i.e., no retransmission peer to peer and no interrupted layer 3 procedures.

10

List of Abbreviations

    GPRS - General Packet Radio Service
15 SGSN - Serving GPRS support node
    GGSN - Gateway GPRS support node
    MSC/VLR - Mobile Switching Centre/Visitor Location Register

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Patent claims

1.   Method for improving the handing over of a connec-
tion from one SGSN (I) to another, i.e. when an MS (Mo-
5   bile Station) moves from one SGSN service area to an-
other,
c h a r a c t e r i z e d   i n   that at inter SGSN rout-
ing update, the old SGSN (I) is given the role as a tem-
porary anchor, whereas the other (new) SGSN (II) is tem-
10   porarily working as a serving SGSN.

2.   Method as claimed in claim 1,
c h a r a c t e r i z e d   i n   that at said inter SGSN
routing update there is created a temporary leg between
15   the old SGSN (I) and the new SGSN (II), said temporary
leg being allowed to prevail as long as connection con-
trol procedure is upheld, including data packet transmis-
sion.

20   3.   Method as claim in claim 1 or 2,
c h a r a c t e r i z e d   i n   that the temporary leg
is allowed to prevail until the state of the connection
in the anchor SGSN (I) can be securely transferred to the
new SGSN (II), while at the same time redirecting packet
25   transfer to go directly from/to SGSN (I) to/from the new
SGSN (II).

4.   Method as claimed in claim 3,
c h a r a c t e r i z e d   i n   that connection control
30   is moved from said anchor SGSN (I) to said serving SGSN
(II) when all activities for the connection have ceased,
i.e. when no data transmission, no layer 3 procedure and
no on-going transactions towards other network nodes pre-
vail.

35

5.   Method as claimed in any of the preceding claims,

c h a r a c t e r i z e d   i n   that the leg between the anchor SGSN (I) and the serving SGSN (II) is created as a Gb interface with minor modifications.

5 6. Method as claimed in any of the preceding claims, c h a r a c t e r i z e d   i n   that the inter SGSN routing update is carried out in a two step signalling sequence, and then without impacting on-going layer 3 procedures and any payload transmission, said temporary

10 Gb channel not being visible for said layer 3.

7. Method as claimed in claim 6, c h a r a c t e r i z e d   i n   that said signalling is carried out between SGSN and external nodes, allowing the

15 connection in question to finish on-going transactions before moving the context to a new SGSN (II), services such as charging being completed towards billing gateway in a normal manner before the context is moved to the new SGSN (II) and charging resumed.

FIG.1
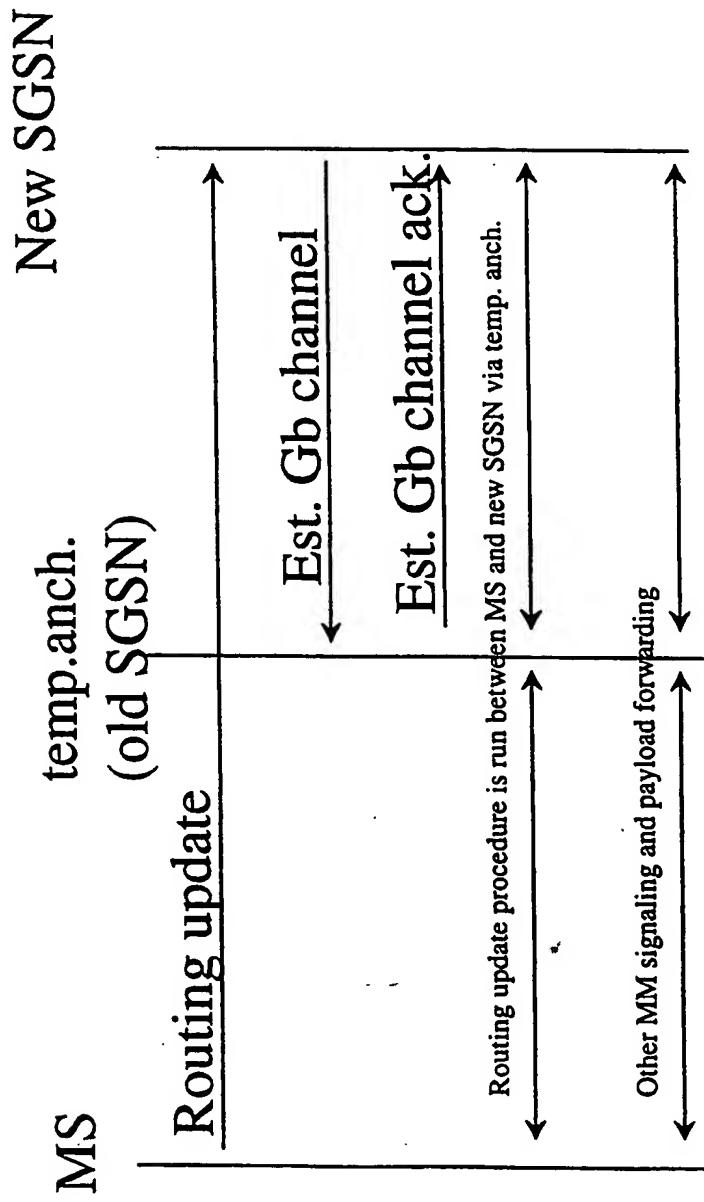
FIG.2

When the connection enters standby state and no layer 3 procedures are ongoing the following procedure apply

GGSN   temp.anch   New SGSN

Context forward

(including LLC state machine)

Routing update

Context forward ack.

(The Gb cannel between anchor and new SGSN is released)

Routing update

(switch to new SGSN)